IMPROVEMENT IN A PRACTICE EXPERIMENT UNDER SCHOOL CONDITIONS

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The importance of knowledge concerning the amount and rate of improvement due to practice under school conditions and concerning the effect of equal amounts of training upon the individual differences found amongst a given group in a given trait is so great that we venture to report a very slight contribution to it.

The experiment consisted in measuring the effect of approximately sixty minutes' practice (in approximately 30 periods of 2 minutes each, given twice daily for the five school days of the week) at adding columns, each of ten digits (0 and 1 not being used). The subjects were twenty-nine boys in a fourth-grade class in New York City.

The score used as a measure of efficiency was the number of examples done *correctly*. That is, no credit was given for an example containing any error. We are unable to report how much interest in the work and in improvement there was.

The group as a whole improved, as the result of the hour's practice, from an average score of 2¾ examples correctly done per minute in the first two periods, to a score of 4½ examples done correctly per minute in the last period. The results thus emphasize the very great gain probably to be expected from applying the method of the practice experiment to certain functions whose improvement is a part of the school curriculum. The individual amounts of improvement are shown in Table I.

If we compare the improvement of the eight boys who showed the least ability at the start (4, 4, 5, 6, 7, 7, 8 and 8 examples done correctly in four minutes) with the seven who showed the most ability at the start (21, 19, 16, 16, 15, 14 and 14 examples done correctly in four minutes,) we find that the latter made equal or greater gross gains (8 on the average to 7.6 for the less able group). What happens when individuals of different abilities are given equal practice in addition is shown still more clearly by Table I, which gives the average scores for: First, the four boys of initial ability 4, 5 or 6; Second, the four boys of initial ability 7 or 8; third, the four boys of initial ability 9; fourth, for the seven boys of initial ability 10, 11 or 12; fifth, for the three boys of initial ability 13; sixth, for the five boys of initial ability 14, 15 or 16; seventh, for the two boys of initial ability 19 and 21.

These results, showing so little power of equal additions to training to reduce individual differences, make it improbable that a very large fraction of the differences found among school children can be justly attributed to differences in amount of training. Since the argument on this point has been stated by Thorndike (*Amer. Jour. Psychol.*, xix, 1908, 383 f.), and by Wells (*Amer. Jour. Psychol.*, xxiii, 1912, 75-88), we will say no more about it. The results of the present study are in entire accord with the view presented by these authors.

TABLE I

SUCCESSIVE SCORES IN ADDITION: FOURTH-GRADE PUPILS

Individual	Number of periods practiced	First two	Second two	Third two	Fourth two	Fifth two	Sixth two	Seventh two	Eighth two	Ninth two	Tenth two	Eleventh two	Twelfth two	Thirteenth two	Fourteenth two	Fifteenth two	Sixteenth two	Gross gain,— First two to Last two
x	25	4	6	5	8	10	9	9	4	3	4	9	6	4				0
y	31	4	7	7	9	5	8	8	9	8	13	11	9	9	12	10	11	7
r	32	5	4	5	5	4	4	5	5	6	8	5	6	7	9	10	11	6
f	31	6	6	10	12	7	11	9	14	17	14	13	12	9	16	13	14	8
Average for x, y, r and f.....		**4.8**	**5.8**	**6.8**	**8.5**	**6.5**	**8**	**7.8**	**8**	**8.5**	**9.8**	**9.5**	**8.3**	**7.3**	**?**	**?**	**?**	**5.3**
s	32	7	13	15	16	16	19	13	16	21	17	19	21	15	20	19	22	15
B	31	7	7	6	8	7	9	10	10	5	10	9	7	9	11	10	11	4
m	32	8	10	13	13	13	12	12	13	10	12	14	14	14	14	16	15	7
v	32	8	10	10	15	11	16	11	14	16	20	20	16	23	16	18	22	14
Average for s, B, m and v.....		**7.5**	**10**	**11**	**13**	**11.8**	**14**	**11.5**	**13.3**	**13**	**14.8**	**15.5**	**14.5**	**15.3**	**15.3**	**15.8**	**17.5**	**10**
e	31	9	6	8	12	9	10	14	9	8	11	13	14	11	16	17	16	7
k	32	9	8	4	9	8	7	10	8	6	7	9	6	7	11	9	9	0
n	29	9	10	12	12	12	10	9	12	11	13	15	15	14	13	16		7
A	32	9	14	13	14	15	12	16	15	19	18	17	17	21	21	21	16	7
Average for e, k, n and A.....		**9**	**9.5**	**9.3**	**11.8**	**11**	**9.8**	**12.3**	**11**	**11**	**12.3**	**13.5**	**13**	**13.3**	**15.3**	**15.8**	**14** (app.)	**5.3**

TABLE I—*Continued*

Individuals	Number of periods practiced	First two	Second two	Third two	Fourth two	Fifth two	Sixth two	Seventh two	Eighth two	Ninth two	Tenth two	Eleventh two	Twelfth two	Thirteenth two	Fourteenth two	Fifteenth two	Sixteenth two	Gross gain,— First two to Last two
b	27	10	11	16	15	10	13	16	14	18	19	19	17	17	20			10
w	30	10	12	12	13	11	17	18	11	11	15	14	12	14	12	13		3
i	32	11	13	12	13	12	15	15	12	10	15	13	14	16	18	18	19	8
C	31	11	13	16	17	11	14	12	14	17	12	12	19	19	14	9	13	2
c	31	12	14	11	13	10	11	15	9	14	16	15	11	11	14	12	18	6
j	32	12	14	15	14	17	21	15	13	18	18	16	21	18	21	22	25	13
q	32	12	10	14	13	13	12	13	15	15	11	12	14	11	10	11	16	4
Average for b, w, i, C, c, j and q		**11.1**	**12.4**	**13.7**	**14**	**12**	**14.7**	**14.9**	**12.6**	**14.7**	**15.1**	**14.4**	**15.4**	**14.9**	**15.6**	**14.7** (app.)	**17.4** (app.)	**6.6**
t	32	13	10	10	13	14	16	11	15	10	9	14	13	14	15	15	13	0
u	32	13	10	16	17	14	16	19	18	20	19	20	20	21	27	23	25	12
z	32	13	11	18	13	17	13	19	21	15	19	16	20	20	17	25	26	13
Average for t, u and z		**13**	**10.3**	**14.7**	**14.3**	**15**	**15**	**16.3**	**18**	**15**	**15.7**	**16.7**	**17.7**	**18.3**	**19.7**	**21**	**21.3**	**8.3**
a	32	14	12	16	16	14	15	17	13	16	16	15	19	19	22	20	16	2
d	29	14	13	10	12	12	12	16	12	7	12	9	14	14	10	16		2
p	29	15	9	15	18	16	13	12	11	17	13	14	12	15	15	16		1
h	32	16	15	18	25	23	23	25	26	28	28	32	29	25	31	34	35	19
o	30	16	16	19	24	24	25	24	21	22	21	15	23	25	25	26		10
Average for a, d, p, h and o		**15**	**13**	**15.6**	**19**	**17.8**	**17.6**	**18.8**	**16.6**	**18**	**18**	**17**	**19.4**	**19.6**	**20.6**	**22.4**	**?**	**6.8**
g	28	19	21	20	23	21	24	22	26	27	29	31	32	32	26			7
l	32	21	24	29	27	27	27	25	31	26	25	28	29	28	28	30	36	15
Average of g and l		**20**	**22½**	**24½**	**25**	**24**	**25½**	**23½**	**28½**	**26½**	**27**	**29½**	**30½**	**30**	**27**	**?**	**?**	**11**